
Installing DC power

Use this chapter to install safety ground/protective earth and logic return wiring, configure system monitors, and connect PFTUs for DC-powered systems using an MFA150 or 600/48 power system.

Note: The procedures in this chapter apply to the global power distribution unit (PDU). The global PDU replaces the one-piece NT7D10AA (North American) and NT7D10DA (European) PDUs. The global PDU comprises an upper NT7D10CA System Monitor/Power Supply Assembly and a lower NT7D67CB Filter/Power Distribution Unit Assembly. Throughout this document, the global PDU is referred to as the “NT7D67CB PDU.” To connect power to a vintage AA or DA NT7D10 PDU, see Appendix B: “NT7D10 PDU connections” on page 455. Both NT7D10 (vintage AA or DA) and NT7D67 PDUs can be used in a system.

To install reserve power equipment (batteries), follow the instructions provided with the equipment. To comply with safety requirements, consult the following articles before working with any battery systems:

- Read the “Material Safety Data Sheet” that must be posted to meet OSHA requirements. This article outlines appropriate reserve battery handling procedures.
- Refer to National Electric Code 645-10. This article outlines requirements that call for the installation of AC- and DC-power kill switches to battery systems in certain environments.

As a safety precaution, all AC service panels should be located in an area that is easily accessible at all times to allow for emergency shutdown. Additionally, each circuit breaker within a panel should be clearly marked to identify the system component or components it services. An optimal location would be near, or just outside the entry to the room containing the DC power system for Meridian 1.

See Appendix A: “NT0R72, NT6D82, QBL12, QBL15, QCA13” on page 411 in this document to perform one of the following tasks:

- connect an NT6D82 Power System
- install and connect a QBL12 Power Distribution Box
- install and connect a power plant consisting of a
 - QBL15 Power Distribution Box
 - NT6D52 or NT0R72 Switched Mode Rectifier (NT0R72 replaces NT6D52)
- connect a QCA13 Power System

External DC power equipment

The MFA150 Modular Power System and the System 600 Power Plant are considered “external” power equipment because they are not housed in Meridian 1 columns.

DC-powered systems generally require one input receptacle per rectifier, within 1.8 m (6 ft) of each rectifier. The commercial power receptacles required are determined by the number and type of rectifiers used.

MFA150 Modular Power System

The MFA150 is a DC power system for options 21, 21E, 51, 51C, 61, 61C, 71, 81, and 81C. It replaces the rectifier/rack assembly consisting of the NT6D52 or NT0R71 Rectifier and QBL15 Power Distribution Unit.

The MFA150 is a modular, front access power system with a positive ground and –48 V dc output capacity of 150 amps, provided in 25-amp increments using plug-in rectifier modules. The MFA150 is suitable for any system with power requirements of less than 150 amps. One MFA150 is required per DC system (configured with one to six NT5C06 rectifiers, as required by system power consumption), installed in one or two MPS75 shelves.

The ordering codes for the complete power plant are NT5C90EF and NT5C90EG. Each of these configurations is a complete power bay with an NT6C14GB Control and Distribution Panel mounted on an NT6C40DC Seismic Rack:

- NT5C90EF is a single MPS75 shelf, with a capacity of 75 amps.
- NT5C90EG is a dual-shelf configuration, with a capacity of 150 amps.

The MFA150 power system requires one 50-amp power feed per shelf.

System 600/48 Power Plant

The System 600/48 Power Plant is a positive ground, –48 V dc, 600-A power plant. It can be used with all Meridian 1 DC-powered systems, but is optimized for larger system configurations such as system options 71, 81, and 81C. Other switchroom equipment that requires –48 V dc power may also be powered from the System 600 Power Plant, as long as there are sufficient output circuit breakers or auxiliary fuses, the total load does not exceed 600 A, and a consistent, single-point ground topology is maintained for all associated equipment.

The System 600 Power Plant consists of either the NT6C32AD main bay (for loads requiring up to 300 A) or the NT6C32AD main bay and the NT6C32AE supplemental bay (for loads up to 600 A), a front access common equipment panel, one front access controller, one front access circuit breaker panel, and two rectifier shelves that can contain up to six NT5CO7AC rectifiers. Included with the supplemental bay are all DC cables and signal wires to connect the supplemental bay to the main bay.

The System 600/48 Power Plant utilizes up to twelve 50-A switch mode rectifiers (NT5CO7AC) as building blocks connected in parallel to reach the maximum capacity of 600 A. This maximum capacity may be attained without power interruption to the load.

The rectifiers operate on single-phase 50 or 60 hertz AC service from either 208 V or 240 V nominal input. The power system may operate with or without –48 V dc batteries for reserve power. If batteries are connected, the rectifiers can operate in either the float or equalize mode.

The System 600/48 Power Plant is designed with access from the front. All operational controls are accessible from the front of the unit. It is designed for seismic environments to Zone 4 (Bellcore) free standing configurations, with no external bracing required.

The System 600/48 Power Plant has a variety of monitoring and alarm features, such as high and low voltage alarms, fuse and breaker alarms, rectifier failure alarms, and low voltage disconnect. An interface to the NT8D22 System Monitor provides a subset of these alarms.

NT6D53 Junction Box

If a rectifier is positioned at a distance from the Meridian 1, the NT6D53 Junction Box can provide an interim connection between the rectifier and the field wiring terminal block in the pedestal. One junction box supports one column. The junction box can be used with the NT7D67CB PDU, but it is not required.

The junction box is equipped with a 3-m (10-ft) flexible conduit that contains all the wiring needed to connect the rectifier to the pedestal. (Make sure the junction box is installed close enough to the pedestal for the conduit to reach the terminal block in the pedestal.)

On the input side, the junction box has allowance for up to four #4 AWG pairs and one logic return, and up to two 1-1/4 in. conduit fittings (one fitting is supplied). On the output side, the junction box is prewired with four #10 AWG pairs (one pair per module) and a logic return. This wiring is routed in a 3-m (10-ft) length of 3/4-in. conduit that connects to the pedestal.

The junction box connects to the pedestal as follows:

- For distances of up to 30 m (100 ft), there are
 - four split feeds per column with nine #10 AWG conductors in a single 3/4-in. conduit
 - two 30-amp feeds from the distribution point to the junction box with five #4 AWG conductors in a single 1-1/4 in. conduit

- For distances of up to 60 m (200 ft), there are
 - four split feeds per column with nine #10 AWG conductors in a single 3/4-in. conduit
 - two 30-amp feeds from the distribution point to the junction box, with nine #4 AWG conductors in two 1-1/4 in. conduits

Safety ground/protective earth and logic return wiring

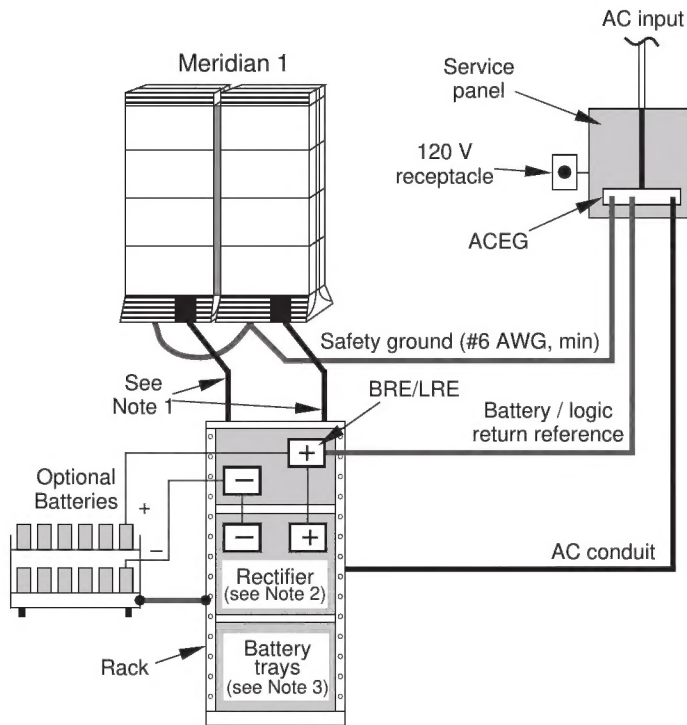
The single-point ground (SPG) required by the system can be an isolated ground (IG) bus or AC equipment ground (ACEG) bus in the service panel or transformer. The system must be connected to safety ground/protective earth in accordance with NEC requirements. For international use, the system must be connected to safety ground/protective earth in accordance with Paragraph 2.5 of EN60950/IEC950.

Note: Refer to *Meridian 1 installation planning* (553-3001-120) and *Meridian 1 power engineering* (553-3001-152) for a complete description of approved ground sources and methods. Insulated ground wire must be used for system grounding.

Depending on the distances between columns, the location of the service panel, and the availability of panel SPG connection points, safety ground/protective earth wiring can be daisy-chained or run independently from each Meridian 1 column to the SPG or alternately to a logic return equalizer (LRE). [Figures 25](#) and [25](#) show safety ground/protective earth wiring in daisy-chain configurations. For the MFA150, safety ground is daisy-chained between columns and then run directly to the ACEG in the service panel. For the System 600/48 Power Plant, safety ground is daisy-chained between columns and then run to the ACEG. The System 600/48 safety ground is connected to the AC panel through the AC input conduit.

Multiple-column systems use an LRE as the point where the logic return wires from different columns are consolidated before connecting to the single-point ground. The LRE used with the MFA150 and System 600/48 is a copper bus bar mounted in the control/distribution panel of the power system.

Figure 24
Ground and logic return distribution—MFA150 Modular Power System



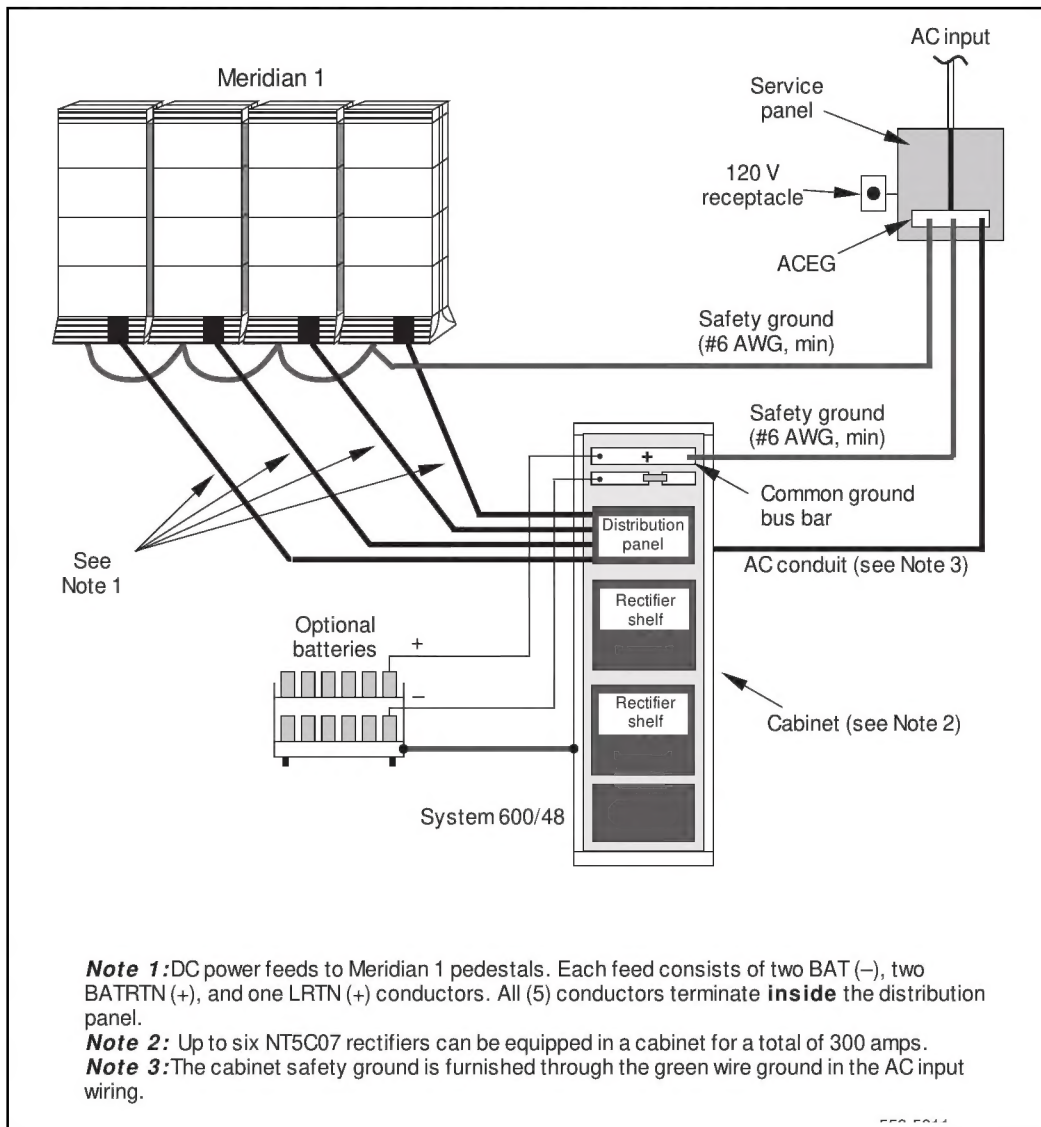
Note 1: DC power feeds to Meridian 1 pedestals. Each feed consists of two BAT(-), two BATRTN(+), and one LRTN(+) conductors.

Note 2: The MFA150 power system may be equipped with one or two power shelves for a maximum of 75 amps or 150 amps, respectively. Each shelf accommodates up to three NT5C06 rectifiers.

Note 3: Batteries may be installed in two optional battery trays located under the rectifier shelves.

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Figure 25
Ground and logic return distribution—System 600/48 Power Plant



PDU connections

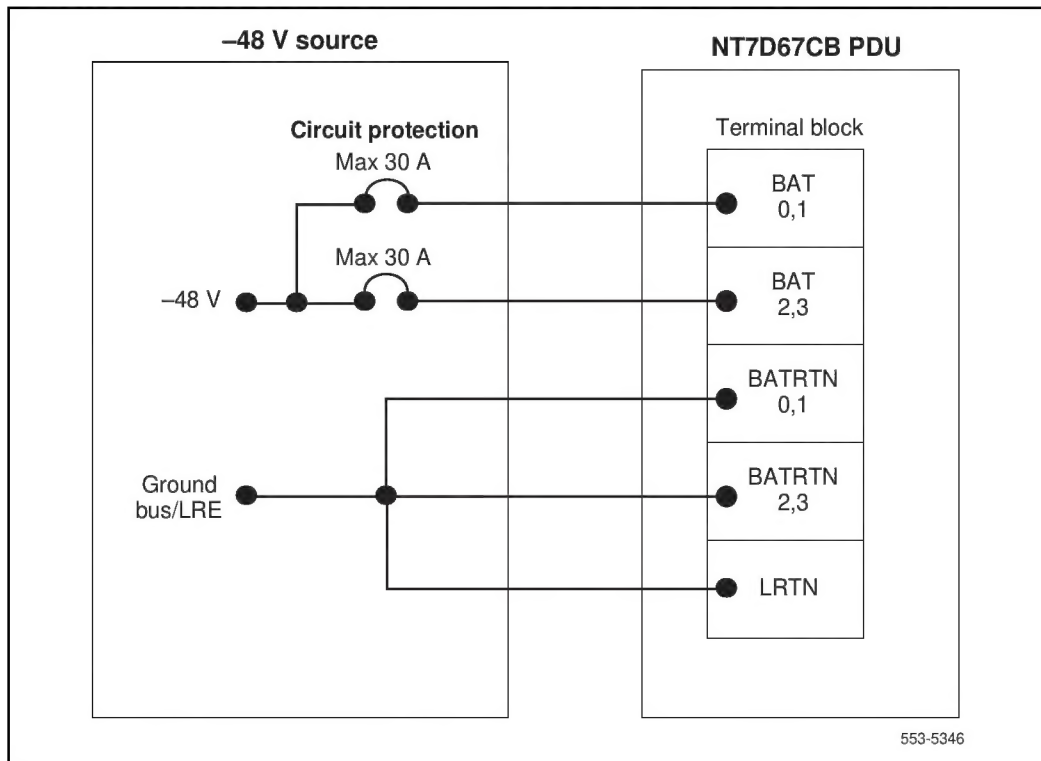
A readily accessible disconnect device for input power is required.

CAUTION

DC power for the NT7D09 pedestal must be provided with circuit protection of 30 amps for the BAT 0,1 and BAT 2,3 feeds (see [Figure 25](#)).

Circuit breakers must be located next to each other and labeled to show that both must be shut off to remove all power to the system.

Figure 26
Circuit protection for the PDU



A maximum loop drop of two volts is allowed between the pedestal, or junction box, and the external power equipment. See [Table 2](#) for allowable wire sizes. See *Meridian 1 power engineering* (553-3001-152) for detailed information on calculating wire size.

Table 2
Wire gauge requirements with two 30-amp feeds (five wires)

Length	#8 AWG	#6 AWG	Single #4 AWG	Double #4 AWG
0–3 m (10 ft)	Yes	Yes	Yes	Yes
3–6 m (20 ft)	Yes	Yes	Yes	Yes
6–9 m (30 ft)	Yes	Yes	Yes	Yes
9–12 m (40 ft)	Yes	Yes	Yes	Yes
12–15 m (50 ft)	Yes	Yes	Yes	Yes
15–18 m (60 ft)	No	Yes	Yes	Yes
18–21 m (70 ft)	No	Yes	Yes	Yes
21–24 m (80 ft)	No	Yes	Yes	Yes
24–27 m (90 ft)	No	No	Yes	Yes
27–30 m (100 ft)	No	No	Yes	Yes
30–60 m (200 ft)	No	No	No	Yes
over 60 m (200 ft)	No	No	No	No
Note 1: Two 30-amp feeds are typically adequate for a column with four modules (five wires total—two 30-amp feed pairs plus logic return). Note 2: If dual conduit is used, the wires must be run in battery/battery return pairs, with one pair in one conduit and the other pair, plus logic return, in the other conduit. Legend: Yes= Wire size is adequate for the distance. No= Wire size has too high a voltage drop and is inadequate for the distance.				

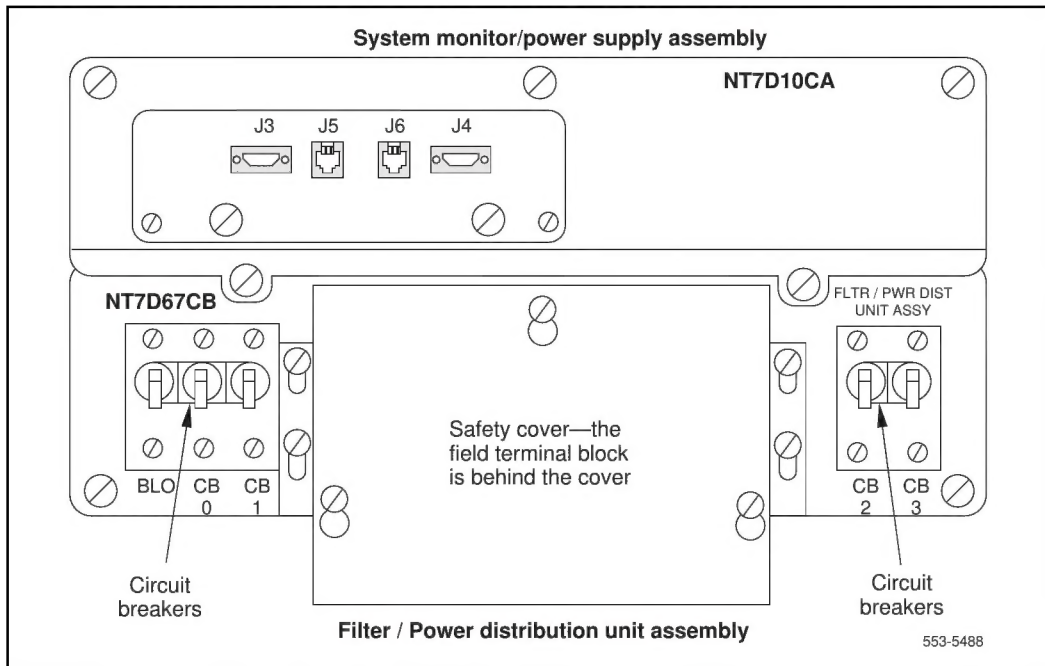
The following equipment is located in the rear of each pedestal (see [Figure 27](#)) in Meridian 1 columns:

- The PDU distributes power to the entire column.
- The field wiring terminal provides the connection point for wiring brought into the pedestal.
- A circuit breaker is provided for each module in the column and for the blower unit

Note: All column circuit breakers will trip if a column thermal overload is detected or a DC-power low-voltage condition is sensed.

- The system monitor checks the column temperature, cooling system status, and system voltage status, and controls alarms and line transfer states accordingly.

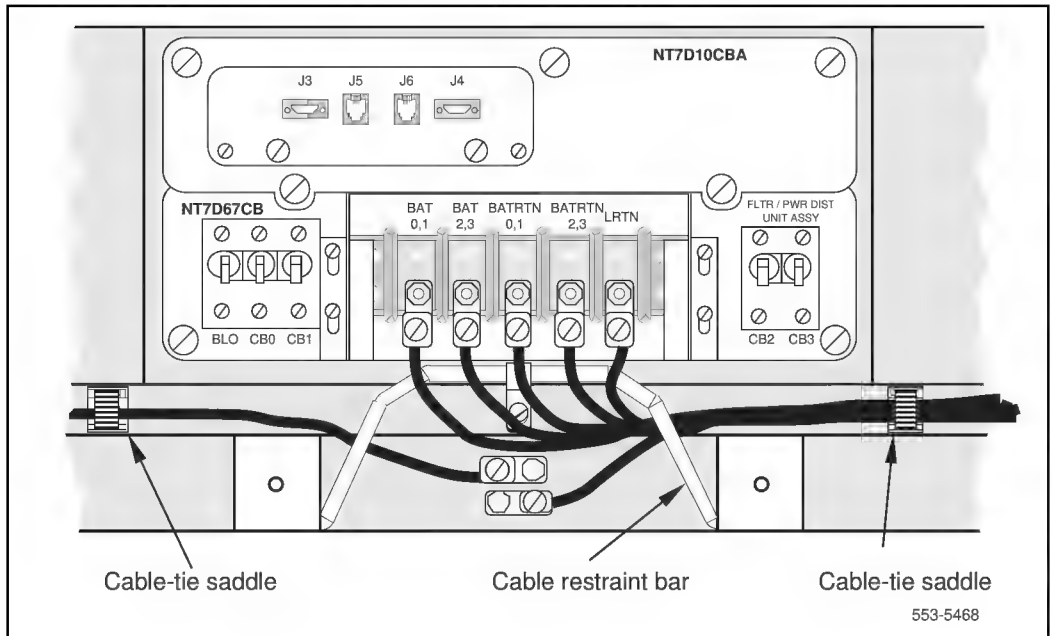
Figure 27
DC-power equipment in the rear of the pedestal—NT7D67CB PDU



With the NT7D67CB PDU, the safety ground/protective earth wires and all wiring to the terminal block in the PDU must be neatly routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal (see [Figure 28](#)). This ensures that there is room to install the PDU cover, safety cover, and rear grill.

Conduit is not required with the NT7D67CB PDU. However, 1-1/4 or 3/4 in. conduit can be used if local codes or individual installations require it. Conduit can be routed down through the column from overhead racks or up through the floor. Conduit clamps and the hardware to fasten the conduit are provided in the pedestal. If the NT7D0902 Rear Mount Conduit Kit is used, conduit can enter from the rear of the column (above the floor).

Figure 28
Cable routing in the rear of the pedestal—NT7D67CB PDU



Installation procedures

Installing safety ground/protective earth wiring

WARNING

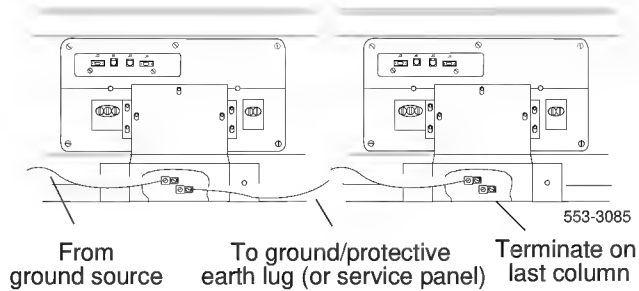
Failure to follow grounding procedures can result in unsafe or faulty equipment. See *Meridian 1 installation planning* (553-3001-120) for a complete description of approved ground sources and methods.

- 1 Remove the associated 30-amp fuse or set circuit breakers to the OFF position in the power plant, to disconnect each pedestal from the power source.
- 2 Remove the air intake grill from the rear of the pedestal.
- 3 At the rear of the pedestal, remove the plastic safety cover over the terminal block to access the safety ground/protective earth lugs (leave the cover off until all pedestal connections are made):
 - Loosen the three screws holding the cover.
 - Lift the cover up, then over the three mounting screws on the front panel of the cover.
- 4 Connect the safety ground/protective earth wire:

Note: Insulated ground wire must be used for system grounding.

For a single-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the pedestal.

For a multiple-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the closest column. Daisy-chain #6 AWG ground wires from one pedestal to the next, connecting all of the columns (or run a #6 AWG wire from the ground source to each column individually).



Note: The safety ground/protective earth wire must be routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.

- 5 Place a warning tag (WARNING—TELEPHONE SYSTEM GROUND CONNECTION—DO NOT DISCONNECT) on the connection at the ground source.

Note: The following procedures apply to columns equipped with the NT7D67CB PDU. To connect power to an NT7D10 (vintage AA or DA) PDU, go to Appendix B: “NT7D10 PDU connections” on page 455.

Preparing the NT7D67CB PDU

When a system is shipped, a set of screws secures the leveling bracket at the rear of the NT7D67CB PDU to protect it from vibration damage during transit. The shipping screws should be removed during initial installation.

- 6 For access to the rear of the PDU, temporarily remove the blower unit in the front of the pedestal:
 - Turn the screws on the front of the blower unit counterclockwise.
 - Grasp the lip at the top edge of the blower unit. Slide the unit out of the glides and onto the bottom ledge of the pedestal. Lift the unit out of the pedestal. (Keep the blower unit in an upright position.)
- 7 Remove the two shipping screws holding the PDU to the vertical shield in the pedestal.
- 8 Reinstall the blower unit:
 - Set the blower unit on the bottom ledge of the pedestal.
 - Tilt the back of the blower unit up slightly so it will slide into the pedestal glides (you may need to lift the unit). Gently push the unit into position.
 - Tighten the screws on the front of the blower unit.

Connecting power from the power plant to the NT7D67CB PDU

Note 1: On columns which have only two modules, five wires can be run to facilitate future expansion to a four module column.

Note 2: If only two modules are used in the column, make sure the CB2 and CB3 circuit breakers are set to off.

- 9 Ensure that power to the power plant is removed from the service panel.
- 10 Remove the air intake grill from the rear of the column pedestal being wired:
 - Remove the two screws securing the air intake grill to the pedestal.

- 11 Remove the plastic safety cover from the PDU:
 - Loosen the three screws holding the cover.
 - Lift the cover up, then over the three mounting screws on the front panel on the cover.
- 12 Remove the top cover from the power plant:
 - Remove the six screws from the top of the power plant.
 - Release the captive screw on the front control panel.
 - Lay the control panel down and remove the top cover.
- 13 Route the wires between the power plant and the pedestal of the column being wired.

Using a junction box:

- If a junction box is used, insert the conduit from the junction box into one of the conduit access holes in the pedestal.
- Route the wires within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.
- Connect the wires to the matching connections on the terminal block on the junction box:
 - Connect the red wires to BAT 0, 1 and BAT 2, 3.
 - Connect the black wires to BATRTN 0, 1 and BATRTN 2, 3.
 - Connect the orange or white wire to LRTN.

Without a junction box:

- Route two red wires between the power plant and the pedestal of the column being wired.
- Route two black wires between the power plant and the pedestal of the column being wired.
- Route one (orange or white) wire for the logic return ground (LRTN) between the power plant and the pedestal of the column being wired.
- Route the wires within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.

14 Connect wires to the PDU:

- Connect a red wire to BAT 0, 1 for modules 0 and 1, and another red wire to BAT 2, 3 for modules 2 and 3 on the connection block.
- Connect a black wire to BATRTN 0, 1 for modules 0 and 1, and another black wire to BATRTN 2, 3 for modules 2 and 3 on the connection block.
- Connect the (orange or white) wire to the LRTN terminal on the connection block.

15 Connect wires to the power plant

- Connect the red wires to the first two circuit breakers in the main control/distribution panel. See [Figure 29](#) for PDU to MFA150 connections and [Figure 30](#) for PDU to System 600/48 connections. Each new column connects the next two available circuit breakers.

Note: If only two modules are used in the column, make sure the CB2 and CB3 circuit breakers are set to off.

- Connect the black wires to the ground bus/LRE.
- Connect the orange or white wire to ground bus/LRE.

16 Replace the plastic safety cover over the terminal block on the PDU.

- Lower the front panel over the mounting screws on the PDU.
- Tighten the three screws holding the cover.

17 Replace the power plant cover.

18 Replace the junction box cover.

Figure 29
PDU to MFA150 connections

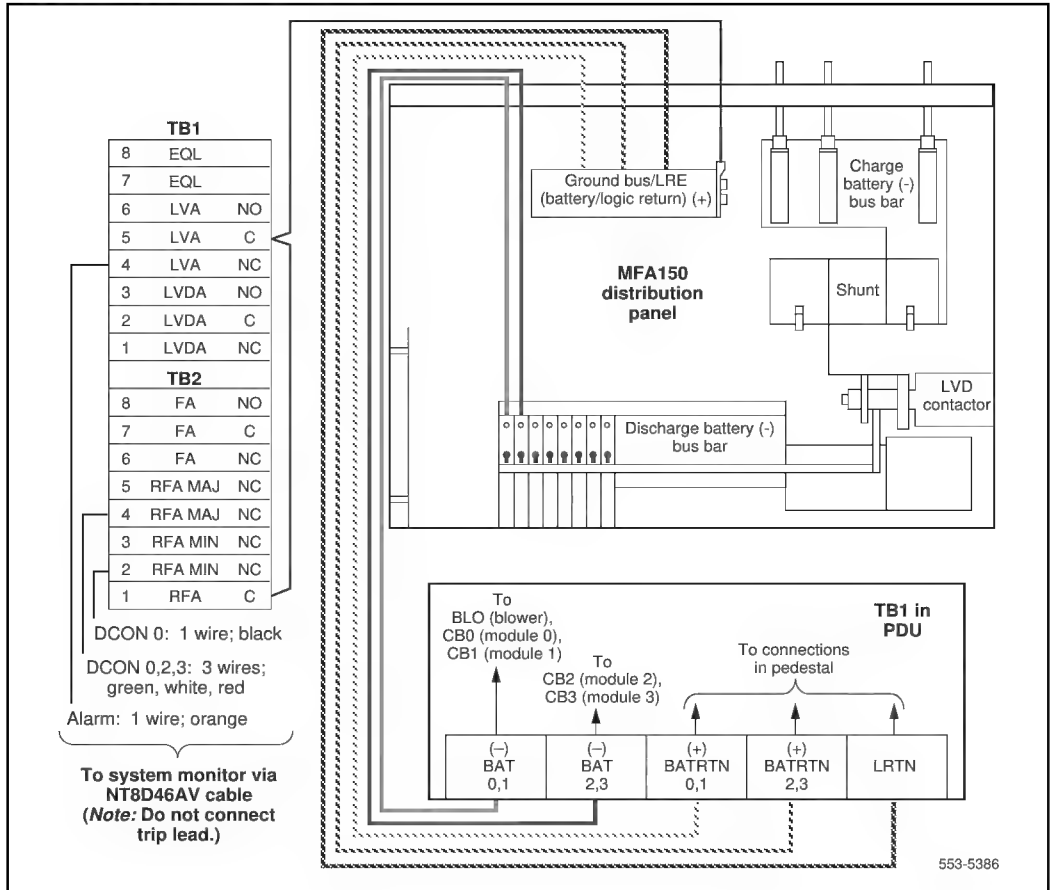
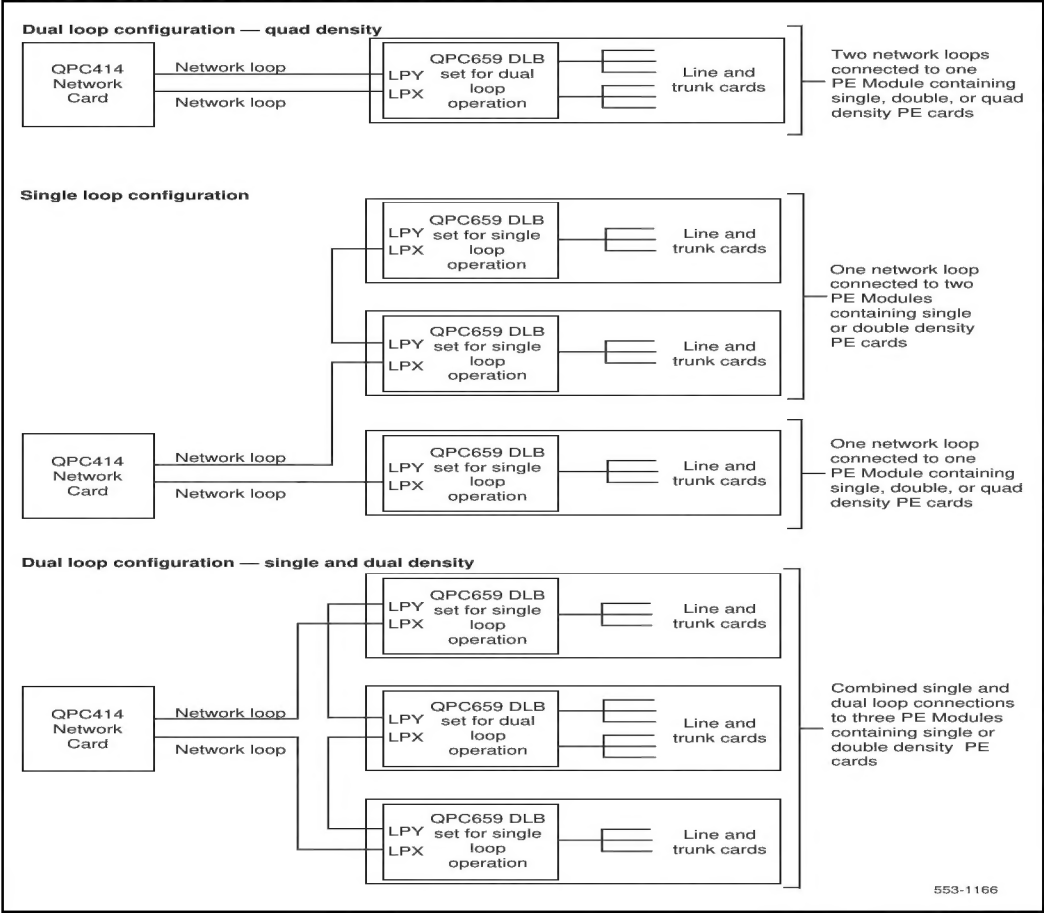


Figure 30
PDU to System 600/48 Power Plant connections



Connecting UK power to the NT7D67CA PDU

To connect the external power system to the pedestal, use the following procedure for each column (this procedure gives the connections for a four-module column).

Note: All wiring to the PDU must be routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.

- 1** Open the front door of the 8B/2R or 8B/4R master power cabinet
- 2** If a junction box is used, insert the conduit from the junction box into one of the conduit access holes in the pedestal.

Connect the wires from the junction box to the matching connections on the terminal block on the PDU:

- Connect the red wires BAT0 through BAT3.
- Connect the black wires RTN0 through RTN3.
- Connect the remaining LRTN wire (orange or white wire).

Note: If a junction box is used, the connections described in Steps 2 through 4 apply to the junction box rather than the pedestal.

- 3** Connect the red BAT (–48V) wires:
 - At the 8B/2R or 8B/4R master power cabinet, connect wires to the first two terminals on the –ve distribution rail (see [Figure 29](#)).
 - At the PDU, connect the wires to the terminal block (one wire feeds two modules):
for modules 0 and 1 connect to BAT 0/1 xxxxx fix these styles xxxx
for modules 2 and 3 connect to BAT 2/3

- 4 Connect the black BATRTN (+48V) wires:
 - At the 8B/2R or 8B/4R master power cabinet, connect wires to the +ve bus
 - At the PDU, connect the wires to the terminal block (one wire feeds two modules):

for modules 0 and 1 connect to BATRTN 0/1 xxx fix these styles
xxx

for modules 2 and 3 connect to BATRTN 2/3
- 5 Connect an orange #8 AWG (10 sq mm) LRTN wire from the logic return equalizer (LRE) in the rear of the master power cabinet to LRTN on terminal block TB1 in the pedestal. (See [Figure 29](#).)
- 6 Reinstall the plastic safety cover over the terminal block:
 - Lower the front panel over the mounting screws on the PDU.
 - Tighten the three screws holding the cover.
- 7 Close the covers on the 8B/2R or 8B/4R master power cabinet.

System monitor connections

When connecting to an 8B/2R or 8B/4R master power cabinet, one NT8D46AT cable is required to extend the alarm terminal to the master system monitor in the pedestal. See [Figure 29](#).

The orange colored wire on NT8D46AT marked “ALARM” extends from any of three alarm terminals on the top of the power cabinet to connector marked J4 in the system monitor. The remaining “Trip” and “DC ON” wires on the NT8D46AT cable are not used and should be snipped before installing the cable.

Figure 31
UEM to 8B/2R or 8B/4R master power cabinet 2R or
8B/4R master power cabinet connections

